

A study of dermatoglyphic patterns and its correlation in bronchial asthma

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Abstract:

Background: Dermatoglyphics is the study of epidermal ridge pattern of sole, palm and finger tips. Dermatoglyphic traits develop in early phase of development and are genetically controlled. Genetic basis of bronchial asthma (BA) is well established. More than one member of the family may be affected by the same disease. We tried to correlate dermatoglyphic patterns of bronchial asthma patients and their first degree relatives and its clinical implications, if any.

Methodology: dermatoglyphic prints were obtained from the hands of 125 patients and their first degree relatives (son & daughter) and compared with 150 normal subjects included as control group. Both qualitative (finger print pattern) and quantitative parameters (a-ridge count, atd⁰, TFRC) of the subjects were measured.

Results Conclusions: Study showed an increase in the number of whorls and TFRC in almost all the digits in BA patients and their first degree relatives as compared to control group. Dermatoglyphic patterns help in early identification of patients with respiratory symptoms that may develop BA and helps in reducing morbidity and mortality associated with the disease.

Keywords: AFRC; Bronchial asthma; Dermatoglyphics; TFRC.

Introduction:

Dermatoglyphics is the study of epidermal ridge patterns of skins of fingers, palms, toes and soles [1]. It has been a useful tool for personal identification and paternity determination since many years in forensic medicine. It has significance because [2] a. dermal ridges and its configuration not altered by age b. dermatoglyphic ridge patterns in each individual is unique and even two identical twins have no similar pattern c. once developed, ridges remain permanent and not affected by environmental factors throughout life [2,3]. the term dermatoglyphics coined by Harold cummins [4] in 1926 which comes from two Greek words derma- skin and glyphein- to carve and refer to friction ridge pattern which appears on palm and sole. Dermal ridge differentiation takes place in 2nd to 3rd month of fetal life and not influenced by movements of hand in utero (Alter, 1966). The resulting dermal patterns are genetically determined and once established never changes throughout life [5]. The unique dermatoglyphic patterns are claimed to have variable expression of genetic traits. Hence the present study was conducted to correlate ridge patterns in bronchial asthma (BA), & first degree relatives to predict future development of their disease. The study of dermatoglyphic patterns has many advantages as a diagnostic tool in chromosomal and developmental defects like mongolism, turner's syndrome, diabetes mellitus, schizophrenia etc. [6]. BA is a chronic inflammatory condition of the airways characterized by hyper reactivity of bronchial tree to various stimuli leading to bronchoconstriction which relieved with or without treatment. It is the commonest cause of morbidity, disability and medical expense affecting nearly 300 million people globally [7]. The relevance of

dermatoglyphic traits is not to diagnose but as a prognostic factor and for the identification of people with the genetic preponderance to the development of certain diseases.

Materials and Methods:

It was a cross-sectional observational study comprise of 125 cases of diagnosed BA by different methods viz-history, physical examination, PFT etc. 125 cases were of 1st degree relatives of BA patients either son or daughter and 150 healthy subjects as control group who do not had any features of respiratory ailments. Subjects of 20 years to 60 years of age of both sexes who had attended the Pulmonary Medicine OPD, Medicine OPD and admitted in the hospital with the history of BA in the CCM Medical College & Hospital, Durg, CG, India were included in the study. Control group comprises of paramedical staff, volunteers of patient's relatives and medical students. An ethical committee approval was obtained.

Exclusion Criteria: Patients having known h/o of COPD, Cor-pulmonale, hypertension, cardio-vascular diseases, ILD, smoking history, post TB bronchiectasis and other chronic chest illness. The aims and procedure of the study was explained to the subjects and their consent was taken. Hands were washed with soap and water. Humidity was removed with the help of Ether which helps to remove greasy material as well. Instead of classical CUMMINS method, stamp pad smeared with black ink used for making finger prints from finger tips of both the hands was taken. Each finger tip was rolled from side to side. Lastly, pressure over dorsum of the hand applied to get tri radii pattern on the palm. With the help of magnifying glass dermatoglyphic pattern on each digit were studied. Following

parameters were analyzed in the present study. Fingertip pattern –whorls, loops, arches, TFRC, AFRC, a-b ridge counting and atd angle. Data collected and analyzed both qualitatively and quantitatively.

Observation: Data thus obtained were tabulated, compared and analyzed statistically. It was seen that number of whorl patterns increased in 1st, 2nd, 3rd & 4th digits of BA cases and in their first degree relative as compared to control. While in first degree relatives number of loops increased in 2nd, 3rd & 5th digits and

decreased in 1st & 4th digits. Arch patterns are decreased in all the digits of BA and their first degree relatives as compared to control.

Statistical Analysis: The data were analyzed using Microsoft Excel. Frequency and percentage were presented for qualitative data analyzed. Non-parametric test: Chi-square test was performed to calculate the significance at 5% ($p < 0.05$) level of significance.

Table 1: Percentage of fingertip pattern in BA, first degree relative & control

	Pattern	Control (1) n (%)	Bronchial Asthma (2) n (%)	First Generation (3) n (%)
Right				
	Whorl	67 (34.01)	74 (37.56)	56 (28.43)
	Loop	75 (40.98)	45 (24.59)	63 (34.43)
	Arch	37 (49.33)	20 (26.67)	18 (24.00)
Left				
	Whorl	48 (30.97)	57 (36.77)	50 (32.26)
	Loop	51 (39.23)	32 (24.62)	47 (36.15)
	Arch	22 (36.67)	22 (36.67)	16 (26.67)
Total				
	Whorl	115 (32.67)	131 (37.22)	106 (30.11)
	Loop	126 (40.26)	77 (24.60)	110 (35.14)
	Arch	59 (43.70)	42 (31.11)	34 (25.19)

Table 2: Comparison of the fingertip pattern between study groups and 'P'-value

	Pattern	p-value 1 vs. 2	p-value 1 vs. 3	p-value 2 vs. 3
Right				
	Whorl	0.0238*	0.0162*	0.4756
	Loop	0.3362	0.2349	0.9009
	Arch	0.3511	0.6627	0.3086
Left				
	Whorl	0.7834	0.3427	0.7978
	Loop	0.1856	0.0595	0.6271
	Arch	0.3673	0.4025	0.3853
Total				
	Whorl	0.0499*	0.0156*	0.7794
	Loop	0.0634	0.0108*	0.9012
	Arch	0.9533	0.6705	0.6955

Note: * indicates significance at $p < 0.05$

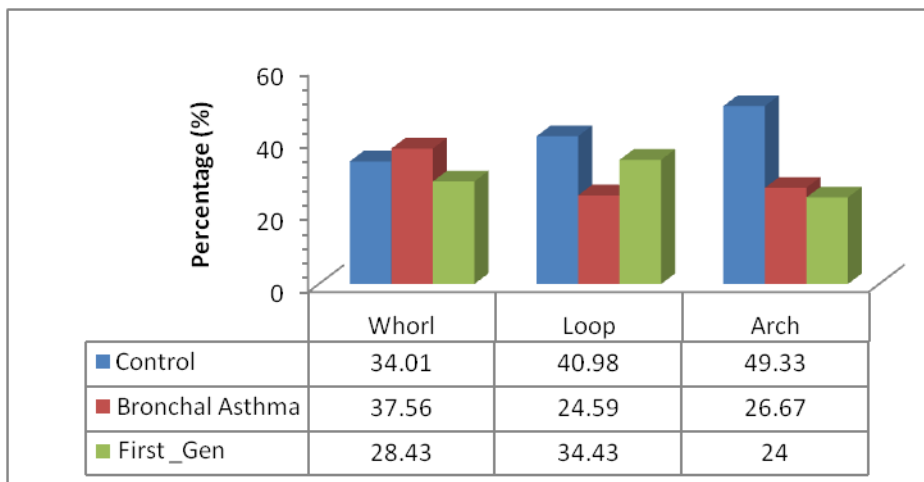


Fig. 1: Distribution of fingerprint patterns in right hand

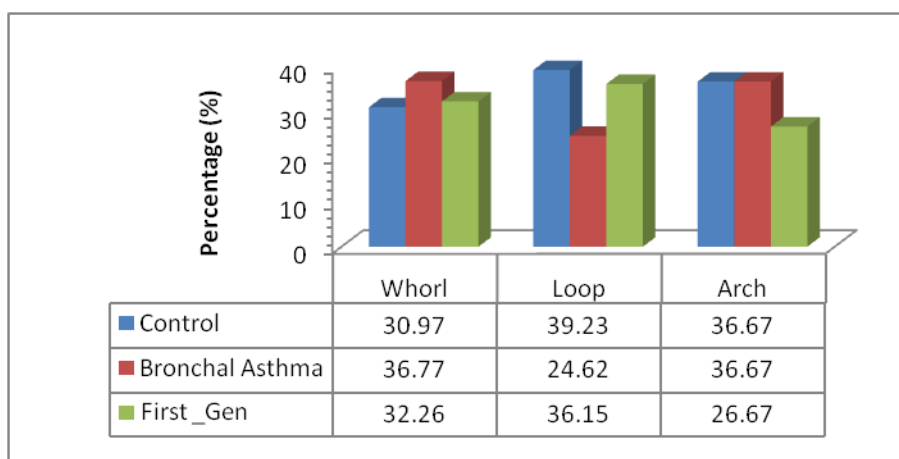


Fig. 2: Distribution of fingerprint patterns in left hand

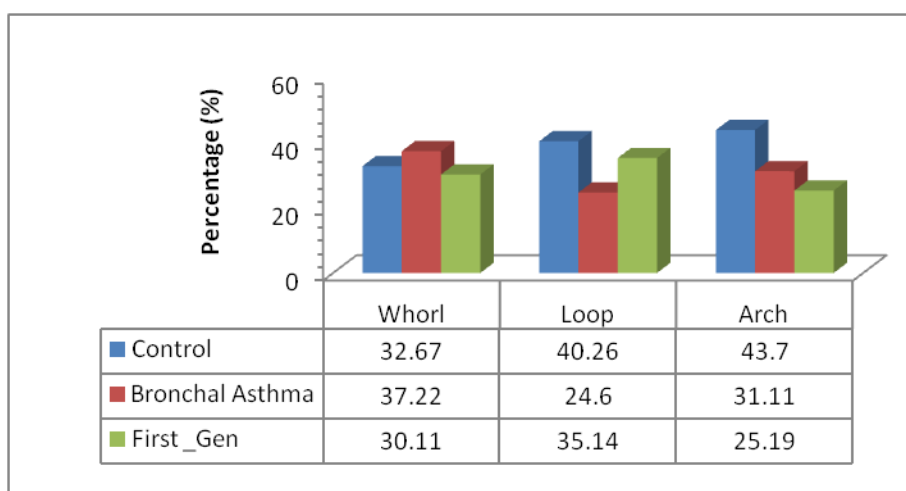


Fig. 3: Distribution of fingerprint patterns in total

Table 3: Comparison of TFRC and AFRC in BA patients, their first degree relative and controls

	BA	First degree relative	Controls	Statistical significance
TFRC				
MEAN	134.64	139.96	112.36	Not Significance

SD	45.42	41.32	38.87	(p>0.05)
AFRC				
MEAN	178.75	163.45	168.12	Not Significance
SD	87.32	76.54	56.98	(p>0.05)

Results:

The incidence of fingerprint patterns in healthy subjects and patients with bronchial asthma and their first generation is shown in Table 1. Statistical analysis was performed for qualitative data. Chi-square test was applied for analyzing the finger- ridge patterns among the three study groups. It was observed that whorls were pre-dominant when compared those of control and both bronchial asthma and first generation. The results were found to be statistically significant ($p < 0.05$) for control versus both Bronchial asthma and First generation for whorls of right hand and total. For loops, the results were found to be statistically significant ($p < 0.05$) for control versus first generation for total. Distribution of the finger tip pattern shows higher concentration of whorl pattern in BA cases as compared to control and their first degree relatives. Mean value of TFRC & AFRC though found to be more in BA as compared to other study group but it was found statically insignificant. atd angle is wider in BA (42°) and first degree relatives (40°) as compared to control (38°).

Discussion:

The present study was aimed to correlate dermatoglyphic patterns in BA with their first degree relatives and its clinical significance. The specific arrangement of papillary ridges over palmar surface is classified as loops, whorls & arches. These epidermal ridge patterns are under genetic influence as first described by Galton & Wilder [8,9]. Loop is simple and common pattern with a core and one delta. It may be ulnar and radial loop. Whorl pattern may be circular or elliptical having two tri radii and single core. Arch pattern may be plain or tented having ridges running transversely across the finger. There are fixed points in the impressions namely 1. triradius/delta/outer terminus is formed by three ridges radiating from a common point and provides a landmark for ridge counting and tracing. 2. Core/inner terminus is the centre of the pattern area from which ridge counting is done. TFRC – Total finger ridge count was the count of the number of ridges from the tri radius to the core pattern and was counted for all the digits of both the hands. Since the whorl has two tri radii, the maximum number of ridges from one of the two tri radii to the core was counted. AFRC – Absolute finger ridge count was the counting of all the ridges of all the digits of both the hands from all the triradii to the core. Since the whorl has two triradii, the number of ridges from both the tri radii to the core was counted [10]. a-b ridge count is the number of ridges bisected by the line drawn between tri radius a (at the base of the index finger) and triradius b

(at the base of middle finger) of each palm and angle is the angle between two straight lines joining the triradius a (under index finger) and triradius d (under the little finger) with the point t on the outer lower portion of palm. Normal atd angle is $30^{\circ} - 65^{\circ}$ [11]. Results obtained in our study which showed predominant whorls pattern of finger prints in BA with decreased loop and arch pattern is similar to the work done by Pakhale et al., who observed increased whorls & AFRC and decreased arches & loop pattern especially in females as compared to control [12]. Gupta et al., [13] observed higher frequency of whorls pattern in 1st digit of both BA and their first degree relatives (sons and daughters) as compared to control, in all other digits Arches are decreased in BA and their first degree relatives. Similarly, Sreenivasulu et al., [14] and Ozkaragoz et al., [15] observed preponderance of whorl pattern in most of the digits of BA and their first generation relatives as compared to controls and presence of whorl pattern on both the thumb was a constant feature in all asthma patients. Results from the comparison study of finger print pattern in Afro-Trinidadian and Indo-Trinidadian bronchial asthma patients by Rao et al., [16] showed that whorls, loops & arches only in IIIrd and IVth digits were significantly increased when compared with control. On the contrary, Cummins & Midlow [3] found decreased frequency of arches in BA patients than control group. However, Sahana et al., and Singh et al., increased frequency of ulnar loop and decreased arches in patients of BA as compared to control group [17,18].

Conclusions:

The presence of whorls type of dermatoglyphic pattern in bronchial asthma patients and their first degree relatives may predict an individual's chance of acquiring BA in future. Similar to family history, clinical examination, study of dermatoglyphic pattern in patients with respiratory ailments may help to identify early cases of BA. However, large scale more elaborate study with the BA patients and their relatives is needed to confirm this conclusion.

Conflicts of Interest: None declared

Acknowledgements: None

References:

1. Dorland's illustrated medical dictionary. Dermatoglyphics. 1994 28th ed. Philadelphia Saunders;WB:449.
2. Gupta UK, Prakash S. Dermatoglyphics. A study of fingertip patterns in bronchial asthma and its genetic

- disposition. *Kathmandu university medical journal*. 2003;1(4):267-71.
3. Cummins H, Midlow C. Palmar and planter epidermal ridge configuration in European Americans. *American J. Phy. Anthropol.* 1926;9:471-506.
 4. Alter M, et al. Variation of palmer creases. *Am. J. Dis. Child.* 1970;120:421-31.
 5. Blanka S, Miltan A. Dermatoglyphics in medical disorder. 1976. Newyork, Heidelberg, Berlin springer.
 6. Sreenivasulu K. A study of Palmar dermatoglyphics of bronchial asthma patients and their first degree relatives in Kurnool district. *Indian journal of Allergy, Asthma and Immunology.* 2012;26:67.
 7. Masoli M, Fabian D, Holt S, Beasley R; Global Initiative for Asthma (GINA) Program. The global burden of asthma. Execuative summary of GINA dissemination committee report. *Allergy.* 2004;59:469-78.
 8. Galtan F. Finger prints 1892. Facsimile Ed. Newyork & London: Macmillion, 1892.
 9. Wilder IW. The ventral surface of mammalian chiridium. *J. Morph. Anthropol.* 1904;49:153-221.
 10. Sangam MR, Krupadanam K, Anasuya K. A study of Finger prints. Bilateral symmetry and sex differences in the region of Andhra Pradesh. *Jrnl. Clin Diag Res.* 2011;5(3):597-600.
 11. Pattern recognition and artificial intelligence. World scientific publishing com. 2008;22(3):601-16.
 12. Pakhale SV, Borole BS, Doshi MA, More VP. Study of the finger tips pattern as a tool for identification of the Dermatoglyphic trait in bronchial asthma. *Jrnl. Clin Diag Res.* 2012;6(8):1397-400.
 13. Gupta UK, Prakash S. Dermatoglyphics: A study of the fingertip patterns in bronchial asthma and its genetic disposition. *Kathmandu university medical journal.* 2003;1(4):267-71.
 14. Sreenivasulu K, Kumar PA, Nagaraju GC, Ravindranath G, Gaikwad MR. A study of palmar dermaoglyphics of bronchial asthma patients and their first degree relatives in Kurnool district. *Indian J Allergy Asthma Immunol.* 2012;26 (1):2-5.
 15. Ozkaragoz. A priliminary study of dermatoglyphics in children with Bronchial asthma. *The journal of asthma research.* 1971;8:179-182.
 16. Rao SR, Baboolal N, Sa B, Rao TR. Palmar dermatoglyphic pattern in bronchial asthma between Afro Trinidadian and Indo Trinidadian. A comparative study. *British journal of medicine & medical research.* 2016;12(11):1-8.
 17. Sahana BN, Bannur BM, Patil BG, Hadimani GA, Jose AP. Dermatoglyphic pattern in patients with bronchial asthma: a qualitative and quantitative study. *International j. of healthcare & biomedical research.* 2013;2(1):38-42.
 18. Singh S, Khurana AK, Harode HA, Tripathi A, Pakhare A, Chaware P. Study of fingerprint patterns to evaluate the role of dermatoglyphics in early detection of bronchial asthma. *J Nat Sci Biol Med.* 2016;7(1):43-6.